

1 What is claimed is:

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3 1. A controller for varying the flow rate of a pump in a predetermined  
4 manner, comprising:

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6 a. a programmable micro-controller for calculating the pulse width and  
7 frequency timing for generating pulse switching signals to control said  
8 pump; and

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10 b. an output switching circuit for generating a pulsed waveform for driving  
11 said pump according to said pulse switching signals.

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13 2. The pump of Claim 1 further comprising an AC permanent-magnet  
14 synchronous motor and a rotor and impeller assembly coupled to said motor.

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16 3. The rotor and impeller assembly of Claim 2, wherein said rotor and said  
17 impeller are concentric and wherein said assembly has means defining a rigid  
18 coupling between said rotor and said impeller for preventing relative rotation.

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20 4. The controller of Claim 1, further comprising a mode switch for choosing  
21 the mode of operation of said micro-controller, wherein the mode of operation is  
22 selected from a group comprised of a programmed flow control variation mode,  
23 an audio input mode, a manual mode and an external data input/output mode.

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25 5. The output switching circuit of Claim 1, further comprising a multiplicity  
26 of solid state power transistors arranged in a configuration selected from a bridge  
27 configuration, a half bridge configuration and a push-pull configuration.

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a 1 6. The output switching circuit of Claim 5, wherein said power transistors  
2 are selected from a group consisting of FET's, IGBT's, bipolar devices or  
3 hybrids.  
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5 7. The controller of Claim 1 further comprising:  
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7 a. audio circuitry for causing the flow rate of said pump to vary  
8 proportionately to a signal from a microphone or an external audio input,  
9 wherein said circuitry further comprises an amplifier with a first  
10 potentiometer for varying said amplifier's gain and a detector circuit for  
11 providing a varying DC level to an analog to digital converter for input into  
12 said micro-controller; and  
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14 b. a second potentiometer coupled to said analog to digital converter for  
15 adjustment of operational parameters dependent on the switch position of  
16 said mode switch.  
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18 8. The controller of Claim 1, further comprising a line receiver/transmitter  
19 for interfacing an external data input/output signal to said micro-controller.  
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21 9. The controller of Claim 1, further comprising rectifier circuitry for  
22 converting alternating current to direct current for driving said micro-controller,  
23 said analog to digital converter, said audio circuitry and said switching circuitry.  
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25 10. The micro-controller of Claim 1, further comprising an embedded  
26 software program for controlling the behavior of said pump over time dependent  
27 upon the settings of said mode switch, said first potentiometer and said second  
28 potentiometer.

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2 11. A controller for varying the flow rate of an AC permanent-magnet  
3 synchronous motor pump comprising:

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5 a. a mode switch for selecting the mode of operation of the controller from  
6 a group comprised of a programmed flow control variation mode, an audio  
7 input mode, a manual mode and an external data input/output mode;

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9 b. a programmable micro-controller for calculating the pulse width and  
10 frequency timing for generating pulse switching signals to control said  
11 pump; and

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13 c. an output switching circuit for generating a pulsed waveform for driving  
14 said pump according to said pulse switching signals.  
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16 12. A fountain for generating variable water patterns comprising:

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18 a. at least one fountain element comprised of a water inlet and one or  
19 more water outlets for the flow of water;

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21 b. an AC permanent-magnet synchronous motor pump having a rigidly  
22 coupled rotor and impeller, the output of said pump connected to the inlet  
23 of said fountain element;

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25 c. a programmable micro-controller for calculating the pulse width and  
26 frequency timing for generating pulse switching signals to control said  
27 pump in a predetermined manner; and  
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d. an output switching circuit for generating a pulsed waveform for driving said pump according to said pulse switching signals.

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